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European Patent Office  
Office européen des brevets

(11) Publication number:

**0 077 072**  
**A2**

(12)

## EUROPEAN PATENT APPLICATION

(21) Application number: 82109430.7

(51) Int. Cl.<sup>2</sup>: H 01 L 29/86

(22) Date of filing: 12.10.82

(30) Priority: 14.10.81 JP 162651/81

(71) Applicant: Hitachi, Ltd., 5-1, Marunouchi 1-chome,  
Chiyoda-ku Tokyo 100 (JP)

(43) Date of publication of application: 20.04.83  
Bulletin 83/16

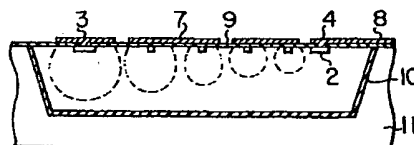
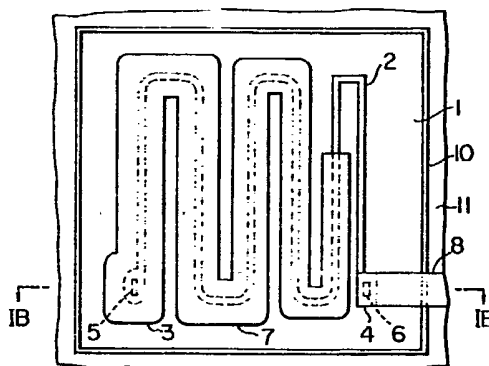
(72) Inventor: Sugawara, Yoshitaka, 1047, Moriyamacho,  
Hitachi-shi (JP)

(84) Designated Contracting States: CH DE FR GB IT LI NL  
SE

(74) Representative: Patentanwälte Beetz sen. - Beetz jun.  
Timpe - Siegfried - Schmitt-Fumian,  
Steinsdorfstrasse 10, D-8000 München 22 (DE)

(54) High voltage resistance element.

(57) A resistance element capable of withstanding a high voltage is formed through impurity diffusion in a single crystal island (1) of a semiconductor integrated circuit substrate. The resistance element includes a resistive region (2; 16) formed in an exposed surface of the single crystal island (1) and folded reciprocally by at least one and a half turns in a planar zigzag-like pattern. The pitch at which the resistive region is folded is decreased as viewed in the direction in which extension of depletion layer formed within the single crystal island upon application of a voltage between two ends of the resistive region is decreased.



HIGH VOLTAGE RESISTANCE ELEMENT

1           The present invention relates to a resistance  
element which is capable of withstanding a high voltage  
and which requires a reduced area for realization  
in an integrated circuit (IC).

5           In these years, semiconductor technology  
has made a remarkable progress, and it seems that  
many efforts are being actively made for developing  
IC which is capable of handling or withstanding higher  
voltages than 100 V (volts). As typical applications  
10 of such high voltage rated IC's, there can be mentioned  
crosspoint switches for exchanges, subscriber circuits,  
vertical output circuits and voice output circuits for  
television receivers, various circuits for handling  
audio frequency signals, various types of switching  
15 regulators and others. These high voltage rated IC's  
and particularly the high voltage rated linear IC's  
have to incorporate indispensably resistance elements  
or resistive regions which are capable of withstanding  
high voltages, i.e. of showing high breakdown voltages.

20           In the case of a low voltage rated IC of  
the hitherto known structure, the area in a semiconductor  
wafer occupied by a passive element such as a resistive  
element is large as compared with the area occupied  
by an active element. Under the circumstances,  
25 the circuit which is designed in such a manner that

1 functions of the passive elements are performed by  
active elements has been developed for promoting  
the realization of various circuits in the form of  
IC. Same approach is also adopted in the development  
5 of the high voltage rated IC's which are capable of  
handling and withstanding high voltages.

However, in the high voltage rated IC and  
inter alia in the case of the high voltage linear IC,  
there exist many circuit portions which require indis-  
10 pensably the resistance elements capable of withstanding  
a high voltage and make it impractical to replace  
these resistance elements by active elements because  
otherwise the number of the latter would be surprisingly  
increased. Further, since a major proportion of the  
15 area occupied by a single high voltage rated active  
element is allotted for assuring the high voltage  
withstanding capability, that is, since the major  
portion of the area in concern is subjected to restric-  
tion imposed by the extent of the depletion layer,  
20 the IC in which each of the high voltage rated  
resistance element is replaced by two or more high  
voltage rated active elements will necessarily require  
an increased area which is remarkably larger than the  
area required by the conventional low voltage IC.  
25 Besides, for the purpose of reducing the overall  
power consumption of the high voltage rated IC, the  
resistance elements incorporated therein are required  
to exhibit, in addition to the high voltage withstanding

1 capability, a high resistance value of 1 k $\Omega$  or more for  
limiting the current produced upon application of  
high voltage. Under the circumstances, in the field  
of the IC technology, there has been a great demand  
5 for the resistance element which is capable of  
withstanding a high voltage and which requires only  
a reduced area for realization thereof while exhibiting  
an improved linearity upon application of the high  
voltage.

10           At present, however, study and endeavour  
paid to the development of the high voltage rated  
resistance element are not yet satisfactory, and  
the inventors scarcely know the reports which deal  
with this problem.

15           For realizing the high voltage rated resist-  
ance element capable of withstanding the high voltage,  
it is necessary to first implement such a structure  
in which the increase in the area occupied by the  
extent of the depletion layer can be reduced to a  
20 possible minimum. In the case of the resistance  
element for the low voltage rated IC, the area occupied  
by the resistance element or resistive region is  
determined by the sheet resistivity thereof and  
accuracy with which the resistive region is realized.  
25 The pitch or distance between the individual resistive  
regions can be made sufficiently small. For this  
reason, the resistance element or resistive region  
of the low voltage rated IC is formed in a regular

1 zigzag-like or meandering pattern in which the  
distance between the individual turns or segments,  
i.e. the pitch of turn is maintained constant through-  
out the meandering pattern. By way of example, refer-  
5 ence is to be made to Japanese Patent Publication  
No. 33863/1981. In contrast, in the case of the  
high voltage rated resistance element to be realized  
in IC, the area occupied by the resistive region is  
primarily determined by the extent of the depletion  
10 layer. As the consequence, a high voltage rated IC  
resistance element realized on the same principle as  
the low voltage rated resistance element would  
require a very large area.

For making it possible to realize the high  
15 voltage rated resistance element (i.e. the resistance  
element capable of withstanding high voltage), the  
structure of the resistance element has to be such  
that the high sheet resistivity can be obtained. In  
the case of the low voltage rated IC, there can be  
20 mentioned a pinch resistor which exhibits high sheet  
resistivity. This pinch resistor is generally prepared  
through the same process as npn-type transistor with  
a view of simplifying the manufacturing process  
as a whole. As the result, the breakdown voltage  
25 of the pinch resistor is as low as the breakdown  
voltage of the emitter junction of the npn-transistor,  
i.e. in the range of 6 to 15 volts.

It is an object of the present invention

- 1 to provide a resistance element for IC which is capable  
of withstanding a high voltage and requires a  
reduced area for the realization.

In view of the above object, there is provided  
5 according to a feature of the present invention a  
high voltage rated resistance element which includes  
a resistive region of a first conductivity type formed  
through diffusion of impurity in a major exposed  
surface of a single crystal island having a second  
10 conductivity type opposite to the first conductivity  
type and formed in a semiconductor integrated circuit,  
characterized in that the resistive region is formed  
in a folded zigzag-like planar pattern of at least  
one and a half turns, and the pitch of folded segments  
15 being progressively decreased in the direction in  
which the extent of depletion layer formed within  
the single crystal island is decreased.

The invention will be better understood  
from the description of exemplary embodiments thereof  
20 taken in conjunction with the accompanying drawings,  
in which:

Fig. 1A shows in a plan view a resistance  
element capable of withstanding a high voltage accord-  
ing to an embodiment of the invention;

25 Fig. 1B is a sectional view of the resistance  
element taken along line IB-IB in Fig. 1A;

Fig. 2 is a plan view showing a resistance  
element capable of withstanding a high voltage according

1 to another embodiment of the invention;

Fig. 3A shows in a plan view a resistance element capable of withstanding a high voltage according to a further embodiment of the invention;

5 Fig. 3B is a sectional view of the resistance element taken along the line IIIB-IIIB in Fig. 3A; and

Fig. 4 shows in a plan view a high voltage resistance element according to still another embodiment of the present invention.

10 Now, the invention will be described by first referring to Figs. 1A and 1B which show, respectively, a surface pattern and a cross-sectional profile of resistance element capable of withstanding a high voltage according to an embodiment of the invention.

15 The illustrated resistance element is destined to be embodied as a linear IC resistor capable of withstanding a high DC voltage and exhibit a resistance value of 30 k $\Omega$  upon application of -400 V across both the terminals of the resistance element. The resistance

20 element is realized by diffusing boron in a n-type single crystal island 1 of Si which is formed in Si-wafer with an impurity concentration of  $3 \times 10^{14} \text{ cm}^{-3}$  and isolated by dielectric insulation. More specifically, a reference numeral 2 denotes a diffused region destined  
25 to serve as the resistance element, 3 and 4 denote, respectively, terminals of the resistance element, 5 and 6 denote, respectively, contact areas, 8 denotes an electrode, 9 denotes a passivation film of  $\text{SiO}_2$ ,

1 10 denotes an  $\text{SiO}_2$ -film for dielectric isolation,  
and 11 denotes a carrier region of polycrystal silicon.  
The boron-diffused resistive region 2 of an elongated  
configuration has a depth of 5  $\mu\text{m}$  and a sheet resis-  
5 tivity of 100  $\Omega/\square$ . Assuming that the diffused  
resistive region 2 has a width of 10  $\mu\text{m}$ , the total  
length of the region 2 required for attaining a resist-  
ance value of 30 k $\Omega$  will amount to about 3,000  $\mu\text{m}$ .  
In view of the effective utilization of available  
10 area, the diffused region 2 is realized in a zigzag-like  
or meandering pattern folded in three turns or six  
segments each having a length of about 460  $\mu\text{m}$ . The  
spaces or pitches between the adjacent individual  
resistive segments are so selected as to be progres-  
15 sively decreased as viewed in the direction from the  
terminal 3 to which a low or negative voltage is  
applied toward the terminal 4 to which the high or  
ground potential is applied, say, in the order of 80  $\mu\text{m}$ ,  
70  $\mu\text{m}$ , 60  $\mu\text{m}$ , 50  $\mu\text{m}$  and 30  $\mu\text{m}$ , as viewed from the  
20 side of the terminal 3, with a view to sparing those  
portions which play no part in sustaining a predeter-  
mined voltage. When a negative voltage of -400 V is  
applied to the terminal 3 with zero volt or ground  
potential being applied to the terminal 4, the potential  
25 at the single crystal island 1 in which the resistive  
region 2 is formed is about 0.6 V. Accordingly,  
the voltage applied across the pn-junction defining  
the resistive region 2 becomes correspondingly increased



1 as the pn-junction approaches to the terminal 3. As  
the consequence, the width of depletion layers formed  
within the n-type single crystal island 1 becomes  
progressively decreased as the depletion layer is  
5 located farther away from the terminal 3, as is  
indicated by broken lines in Fig. 1B. This means that  
pitch interval between the adjacent segments of the  
zigzag pattern which is required for assuring the  
desired voltage withstanding capability can be corres-  
10 pondingly decreased for the segments remote from  
the terminal 3. Here, with the term "pitch", it is  
intended to mean the inter-segment center interval  
which is derived by adding tolerance involved in  
the resistance manufacturing process to calculated  
15 widths of the depletion layers at the various segments  
of the zigzag-like resistive (diffused) region 2.

In the case of the embodiment now being  
described, the electrode 7 attached to the low or  
negative voltage terminal 3 is caused to extend  
20 along and over the diffused resistance region 2 in  
such a manner that the electrode 7 laterally extends  
or spreads beyond both sides of the pn-junction defining  
the resistive region 2. The laterally spreading  
electrode 7 thus can serve as a so-called field plate.  
25 Describing in more detail, the passivation layer 9 of  
 $\text{SiO}_2$  prepared by an IC fabrication process may generally  
contain positive electric charge, as the result of  
which negative carriers and/or negatively charged

1 elements may be attracted onto the surface of the  
n-type single crystal island 1, whereby the impurity  
concentration will be increased at the surface of  
the n-type island 1 as compared with the interior of  
5 the island 1. When this occurs, extent of the depletion  
layer is suppressed at the surface of the n-type island  
1 with the intensity of surface electric field being  
increased to thereby lower the breakdown voltage. In  
this connection, it should be noted that field plate  
10 constituted by the laterally spreading electrode 7  
is at a lower potential as compared with the n-type  
single crystal island 1 and thus can repulse the negative  
carriers and/or the negative charge to thereby suppress  
the tendency of the impurity condensation at the  
15 surfacial region of the n-type single crystal island 1  
and prevent the lowering of the breakdown voltage.

In the case of the embodiment being now  
considered, the length of the field plate 7 is so  
selected as to satisfy the condition defined by the  
20 following expression:

(Length of field plate)  $\approx$  (length of resistive region)

$$\times \frac{(\text{applied voltage} - 100 \text{ V})}{\text{applied voltage}} .$$

Further, the width of the field plate, i.e. the width  
of the electrode 7 laterally spreading beyond the  
sides of the pn-junction of the resistive region 2 is  
selected to be larger as it is located nearer to the

1 terminal 3. More specifically, the overhang widths  
of the laterally spreading electrode 7 are selected  
to be 25  $\mu\text{m}$ , 20  $\mu\text{m}$ , 15  $\mu\text{m}$ , 10  $\mu\text{m}$  and 5  $\mu\text{m}$  for the  
first to the fifth segments, respectively, as counted  
5 from the side of the terminal 3, so that concentration  
of the electric field may be mitigated more forcibly  
at the surface portion where higher voltage is applied.

Further, corners of the resistive region 2  
are rounded with an appropriate curvature to further  
10 mitigate the concentration of the electric field. Addi-  
tionally, the passivation film 9 of  $\text{SiO}_2$  is made as  
thick as 3.1  $\mu\text{m}$  so that the  $\text{SiO}_2$ -film 9 may be protected  
from dielectric breakdown at the potential difference  
of about 310 V applied between the resistive region 2  
15 and the end of the field plate 7 remoted farthest from  
the terminal 3 across the passivation film 9.

The field plate 7 serving also as the  
electrode may be spared over a portion of the resistive  
region which is located nearer to the terminal 4 of  
20 the ground potential for the reason mentioned below.  
Experiments carried out by the inventors of the present  
application have shown that the breakdown voltage of  
the pn-junction in the case where no field plate is  
present is relatively more sensitive to the influence of  
25 the amount of positive charge present in the  $\text{SiO}_2$ -  
passivation layer 9 and thus varies significantly in  
dependence on lots. It has however been found that  
the breakdown voltage of the pn-junction is never lower

1 than 100 V in case the depth of the pn-junction is  
greater than 2  $\mu\text{m}$ . Accordingly, the field plate  
may be spared at the portion where the applied voltage  
is low. When the field plate 7 is so provided as to  
5 extend from the terminal 3 at which the highest reverse  
voltage is applied to the pn-junction forming the  
resistive region 2 to a location of the pn-junction at  
which the applied reverse voltage becomes equal to or  
lower than 100 V, there can be assured a breakdown  
10 voltage which is comparable to that attained with the  
aid of the field plate which extends to the vicinity of  
the terminal 4. In general, as the width of the field  
plate or electrode 7 spreading laterally outwardly  
beyond the width of the pn-junction forming the  
15 resistive region 2 is increased, the electric charge  
on the surface of the n-type single crystal island 1  
can be more mitigated. However, in the case of the  
resistive element 2, the applied voltage is progres-  
sively decreased as viewed in the direction from  
20 the terminal 4 to the terminal 3. For this reason,  
the width of the field plate 7 may be correspondingly  
progressively decreased, as viewed in the same direc-  
tion. On the contrary, in the case where the width  
of the field plate 7 is uniformly distributed over  
25 and along the whole length of the resistive region 2  
with a constant width selected for the portion at  
which the highest voltage is applied, the pitch of  
the segments of the resistive region 2 folded in

1 the zigzag-like pattern could not be progressively  
reduced due to the limitation imposed by the constant  
width of the field plate 7. In contrast, in the case  
of the embodiment shown in Figs. 1A and 1B, it is  
5 possible to progressively reduce the pitch down to the  
value determined by the smallest width of the depletion  
layer, as described hereinbefore.

It has been found that the embodiment of  
the invention described above allows the area occupied  
10 by the resistive region 2 to be reduced by 38% when  
compared with the prior art resistance element in which  
the inter-segment pitch is selected constant at 80  $\mu\text{m}$ .  
As is well known, the passive elements such as resistors  
and the like occupy larger area in the integrated  
15 circuit or IC as compared with the active elements.  
Accordingly, the significant decrease in the area  
occupied by the resistor which can be attained  
according to the teaching of the invention disclosed  
above makes a great contribution to the reduction in  
20 size of the chip used for the IC.

Fig. 2 shows a surface pattern of the  
resistance element realized according to a second  
embodiment of the invention.

This embodiment is substantially identical  
25 with the resistance element described above in conjunc-  
tion with Figs. 1A and 1B except that the field plate  
is divided into two parts, one of which designated by  
12 is connected through a through-hole 13 to the

1 resistive region 2 at an intermediate portion between  
the terminals 3 and 4, and that the oxide film 9  
interposed between the field plates and the resistive  
region 2 is formed as thin as 1.5  $\mu\text{m}$ .

5           When the voltage of -400 V is applied to  
the terminal 3 in the resistance element now being  
considered, the voltage making appearance at a portion  
14 of the resistive region 2 located in opposition to  
that portion of the first field plate 7 which is removed  
10 farthest from the terminal 3 will be about -250 V,  
producing a potential difference of about 150 V relative  
to the first field plate 7 (-400 V). On the other hand  
the second field plate 12 is connected through the  
contacting through-hole 13 to the resistive region 2  
15 at a location to which a voltage of about -248 V is  
applied. On the conditions, the potential at the  
second field plate 12 is on the order of -248 V  
even at an end portion 15 thereof which is located  
closest to the terminal 4 and removed farthest from  
20 the through-hole 13. The potential at the portion of  
the resistive region 2 located in opposition to the  
end portion 15 is about -100 V which corresponds to  
the potential difference of about 150 V appearing  
between the second field plate 12 and the resistive  
25 region 2 at the end portion 15.

As will be appreciated from the above description, the structure of the resistance element according to the second embodiment of the invention allows

1 the maximum potential difference appearing between  
the resistive region 2 and the field plate (7, 12) to  
be made smaller than the corresponding potential  
difference produced in the resistance element according  
5 to the first embodiment. For this reason, the inter-  
posed oxide film 9 may be made considerably thinner  
than that of the first embodiment while assuring a  
sufficiently high voltage withstanding capability to  
prevent the dielectric breakdown. The second embodiment  
10 provides a great advantage in the manufacturing process.  
More specifically, in the case of the first embodiment  
of the invention, a step of forming the thick oxide  
film, i.e. the wet oxidizing process or a number of  
CVD processes or the like which take a lot of time is  
15 required in succession to the step of diffusing boron  
for forming the resistive region 2. In contrast, in  
the case of the second embodiment of the invention,  
formation of the oxide film can be accomplished by a  
single CVD process or by a thermal processing step  
20 effected in the mixed atmosphere of hydrogen and  
oxygen in succession to the diffusion of boron.

Fig. 3A shows a surface pattern of the  
resistance element according to the third embodiment  
of the invention, and Fig. 3B shows a partially enlarged  
25 cross-sectional view of the same taken along the  
line IIII-B-IIIIB in Fig. 3A.

The resistance element according to the  
third embodiment of the invention is destined to be

1 incorporated in an IC for a high DC voltage and exhibit  
a resistance value of 300 k $\Omega$  upon application of - 400  
volts between both terminals 3 and 4. For realizing  
the resistance element according to the third embodiment,  
5 an n-type single crystal island 1 having impurity  
concentration of  $3 \times 10^{14} \text{ cm}^{-3}$  and formed in a Si-wafer  
through dielectric isolation is formed with a p-type  
layer 16 through diffusion of boron, which is followed  
by diffusion of phosphorus through same aperture as  
10 used in the diffusion of boron to thereby form an n-  
type layer 17 which constitutes a pinched portion  
through cooperation with the p-type layer 16. Subsequent-  
ly, electrodes 7 and 8 and then the field plate generally  
denoted by 12 are formed to obtain the finished  
15 resistance element.

Diffusion depths of boron and phosphorus  
are of 5  $\mu\text{m}$  and 3.5  $\mu\text{m}$ , respectively, while the sheet  
resistivity of the pinched portion is of 3 k $\Omega/\square$ .  
Since the width of the resistive region is selected  
20 equal to 10  $\mu\text{m}$ , the overall length of the resistive  
region is 1,000  $\mu\text{m}$ . The resistance element is formed  
in a folded zigzag-like pattern of 1.5 turns so as to  
have three segments each of 320  $\mu\text{m}$  in length. The pitch  
between the adjacent segments is selected 100  $\mu\text{m}$  on  
25 the side of the terminal 3 to which a low voltage is  
applied, while the pitch is decreased to 60  $\mu\text{m}$  on the  
side of the terminal 4 to which a high voltage (ground  
potential) is applied. The advantages due to the



1 arrangement of this third embodiment are substantially  
same as those brought about in the first embodiment  
of the invention described hereinbefore. It will be  
noted that the field plate is divided into two parts  
5 for the purpose and effect as in the case of the  
second embodiment.

Since the concentration profile of the p-type  
layer 16 of the third embodiment now being considered  
is set to the same profile of a npn-type transistor  
10 destined for handling a voltage on the order of 400  
volts, there is no danger of the p-type layer 16  
being punched through even at a region in the vicinity  
of the terminal 3. It should also be noted that the  
 $n^+$ -layer 17 is connected to neither electrode nor  
15 field plate but is in the floating state. Accordingly,  
there is present between the  $n^+$ -type layer 17 and the  
p-type layer 16 a potential difference of 0.6 volts  
which corresponds to the diffusion (built-in) potential,  
and thus no breakdown will occur in the  $n^+p$ -junction  
20 even in the vicinity of the terminal 3. Further,  
because the oxide film 9 formed above the  $n^+$ -type layer  
17 is in thickness of 1.5  $\mu\text{m}$  or more even at the thinnest  
portion 18 of the underlying diffusion aperture portion,  
the possibility of dielectric breakdown is excluded  
25 even at the highest potential difference of 140 V  
appearing between the field plate and the  $n^+$ -layer 17.  
In other words, the high voltage withstanding capability  
comparable to that of the first and the second

1 embodiments can be realized. On the other hand, the  
area occupied by the resistive region can be reduced  
down to about 1/30 of that of the first and the  
second embodiments by virtue of the fact that the  
5 sheet resistivity can be realized 30 times as high as  
that of the first and the second embodiment.

It should be added that in the case of the  
third embodiment, the capability of withstanding the  
voltage in the range of 120 to 250 volts can be attained  
10 even when the field plate is not employed. The resist-  
ance element of this arrangement (i.e. without the  
field plate) may be satisfactorily used in the IC  
destined to handle the voltage on the order of 100  
volts.

15 Fig. 4 shows a resistance element according to  
the fourth embodiment of the invention.

The resistance element according to the  
fourth embodiment is intended to be incorporated  
as a linear IC element which is capable of withstanding  
20 a high AC voltage and exhibit a resistance value of  
30 k $\Omega$  upon appearance of a voltage difference of 400  
volts between both terminals 3 and 4 to which voltages  
of different polarities are applied.

The resistance element according to the  
25 fourth embodiment is different from the second  
embodiment only in respect of the pitch and the length  
and width of the field plates. In the case of the  
fourth embodiment being considered, the inter-segment

1 pitch is selected to be 80  $\mu\text{m}$ , 70  $\mu\text{m}$ , 60  $\mu\text{m}$ , 70  $\mu\text{m}$  and  
80  $\mu\text{m}$  as viewed from the contact 3. One (7) of the  
field plates extends from the terminal 5 toward the  
terminal 4 about 1480  $\mu\text{m}$ , while the second field  
5 plate 8 extend from the terminal 4 toward the terminal  
3 for ca. 1480  $\mu\text{m}$ . Further, the width of the field  
plates are selected at 25  $\mu\text{m}$ , 20  $\mu\text{m}$ , 15  $\mu\text{m}$ , 15  $\mu\text{m}$ ,  
20  $\mu\text{m}$  and 25  $\mu\text{m}$  for each of the resistive segments  
in the direction viewed from the terminal 3.

10 In the case of the instant embodiment, the  
terminal to which the low voltage is applied is  
alternately exchanged between the terminals 3 and 4  
as the polarity of the voltage applied across these  
terminals are changed. However, the potential at  
15 the n-type single crystal island 1 in which the resistive  
region 2 is formed is constantly at magnitude equal to  
the lowest voltage plus the diffusion potential at  
the resistive region. Accordingly, the width of  
the depletion layers produced upon application of the  
20 voltage of 400 volts will be decreased at one time  
and increased at other time as the polarity of the  
applied voltage is changed over. The resistance element  
according to the fourth embodiment is implemented with  
the geometrical parameters mentioned above in consider-  
25 ation of this fact. The resistance element according to  
the fourth embodiment of the invention allows the area  
occupied by the resistive region 2 to be reduced by  
ca. 5% as compared with the corresponding resistance

1 element of the prior art. It will be seen that as  
the required breakdown voltage and the resistance  
value are increased, the occupied area can further  
be decreased.

5 In the foregoing, four preferred embodiments  
of the invention have been disclosed. However, it  
goes without saying that various and numerous modifica-  
tions and versions will readily occur to those skilled  
in the art within the scope of this invention.

10 Further, it will be understood that the area  
of a wafer occupied by a resistive region can be  
minimized without imposing restriction on the extent  
of the depletion layer, and that the sheet resistivity  
can be increased without exerting adverse influence  
15 to the breakdown voltage or the voltage withstanding  
capability. Thus, the resistance element which is  
capable of withstanding a high voltage and requires a  
reduced area for realization thereof has been provided.

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WHAT IS CLAIMED IS:

1. A high voltage rated resistance element characterized by a resistive region (2, 16) of a first conductivity type formed through diffusion of impurity in a major exposed surface of a single crystal island (1) having a second conductivity type opposite to the first conductivity type and formed in a semiconductor integrated circuit, characterized in that the resistive region (2, 16) is formed in a folded zigzag-like planar pattern of at least one and a half turns, and the pitch of folded segments being progressively decreased in the direction in which the extent of depletion layer formed within the single crystal island is decreased.
2. A resistance element according to claim 1, characterized by at least a first field plate (7) connected to one (3) of said ends (3, 4) of said resistive element (2; 16) and disconnected from the other end (4) thereof and formed on a passivation layer (9) formed on said single crystal island (1) in conformity with the planar pattern of said resistive region (2; 16), said field plate laterally spreading out beyond the width of said resistive region (2; 16).
3. A resistance element according to claim 2, characterized in that  
/a portion (13) of said resistive region (2; 16) which is not covered with said first field plate (7) is covered with a second field plate (12) which is connected to said portion (13) of said resistive element

and disconnected from said other end (4), said  
second field plate being formed on said passivation  
layer (9) along the planar pattern of said resistive  
portion while laterally spreading out beyond the  
5 width of said resistive region (2; 16).

FIG. 1A

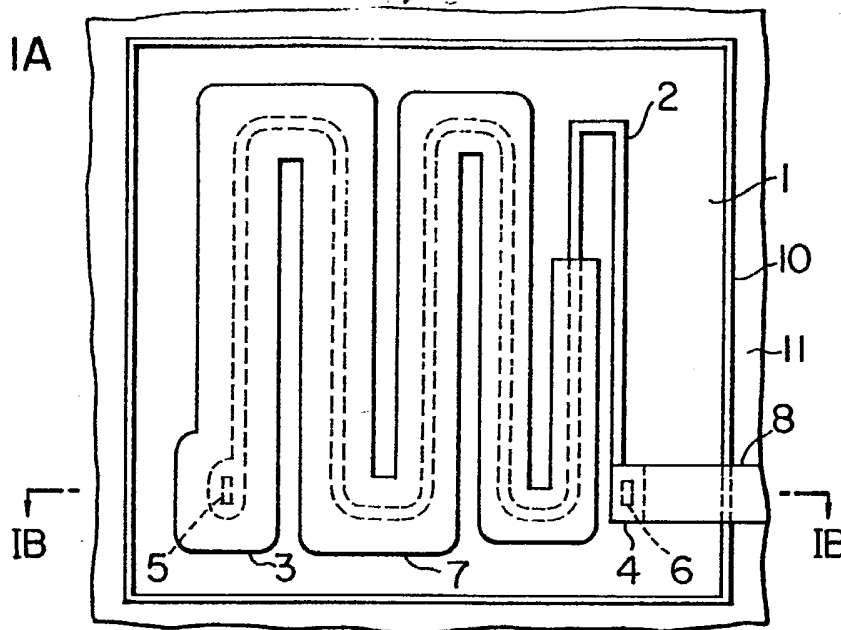


FIG. 1B

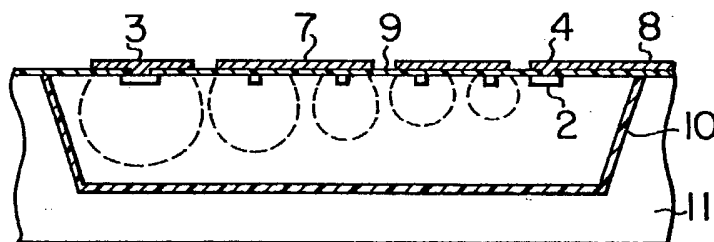


FIG. 2

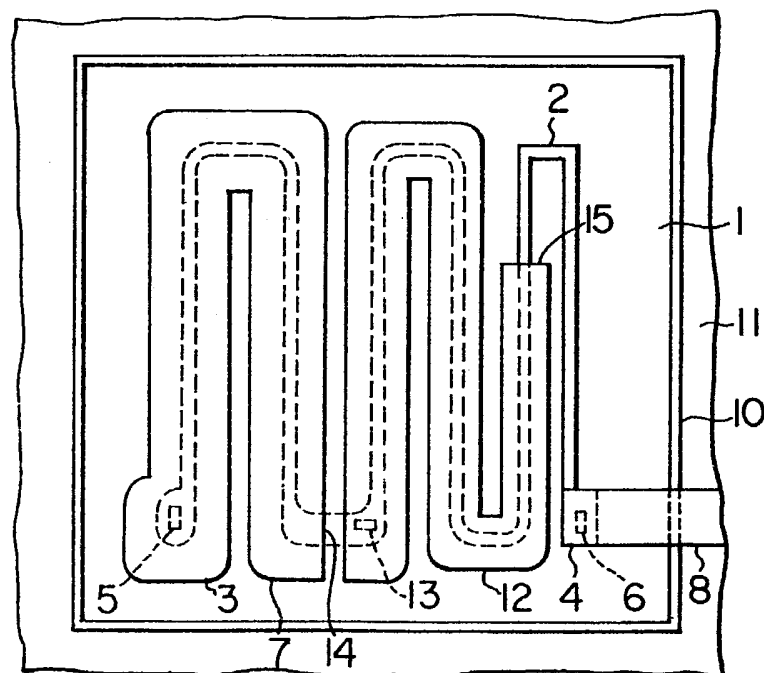


FIG. 3A

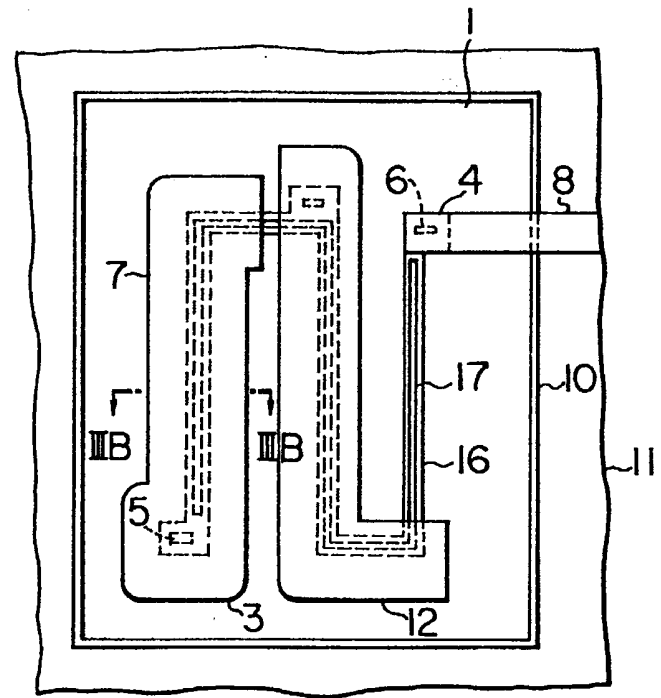


FIG. 3B

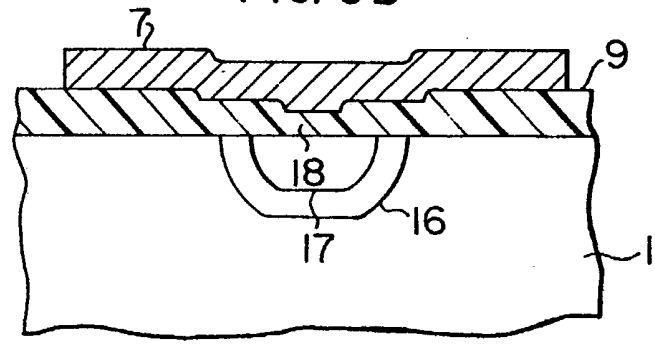




FIG. 4

